

## **REMARKS**

The present Response is intended to be fully responsive to all points of rejection raised in the Office Action dated May 28, 2008. The present Response is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

Applicants assert that the present invention is new, non-obvious and useful. Prompt reconsideration and allowance of the claims are respectfully requested.

### **Status of the Claims**

Claims 1, 4-5, 13 and 15 are pending in the application. Claims 1 and 13 have been amended. No new matter has been added. Support for the amendments can be found in paragraphs 20 and 24 of the originally filed specification.

### **Claim Rejections – 35 U.S.C. §112, first paragraph**

The rejection stated that the recitation of “material composition of said impure copper seed layer is the same as material composition of said impure copper fill” in lines 9-10 of claim 1 and lines 11-12 of claim 13 introduces new matter into the claim because:

the original specification confirms that “the composition of the copper in the impure copper seed layer and electroplated copper will be slightly different” (line 13-14 of para. 20) or in other lines of the same paragraph states “the composition of the impure copper seed layer and electroplated copper...remains substantially similar” in lines 23-28. Or perhaps in [para.24], lines 6-8 states “the composition of the copper in the impure copper seed layer 440 is substantially the same as the electroplated copper 350” etc... (Office Action, pg. 3).

In response to the claim rejections, Applicants have amended the claims to recite that the material composition of said impure copper seed layer is substantially the same as the material composition of said impure copper fill. Such limitation was originally in the claims, but Applicants removed the term “substantially” in response to Examiner’s objection that the term “substantially” was overly broad. Applicants will respond to the Examiner’s objection that the term “substantially” was overly broad in the following

response, however Applicants respectfully request withdrawal of the 35 U.S.C. § 112 rejection in view of the present claim amendments.

In an effort to further define the term “substantially,” Applicants have amended claims 1 and 13 to include limitations that concern the impurity content of both the first and second impure copper sources for the impure copper seed layer and the impure copper fill. Support for the amendments can be found in at least paragraph 24 of the patent application as originally filed.

Prior to deposition, the composition of the copper in the impure copper seed layer 440 is substantially the same as the electroplated copper 350 because both are derived from a source with an impurity content of not more than 1.20% by weight and not less than or equal to 0.001% by weight. (¶24).

Applicants note that MPEP §2173.05(b) discusses the definiteness of the term “substantially.”

The term "substantially" is often used in conjunction with another term to describe a particular characteristic of the claimed invention. It is a broad term. In *re Nehrenberg*, 280 F.2d 161, 126 USPQ 383 (CCPA 1960). The court held that the limitation "to substantially increase the efficiency of the compound as a copper extractant" was definite in view of the general guidelines contained in the specification. In *re Mattison*, 509 F.2d 563, 184 USPQ 484 (CCPA 1975). The court held that the limitation "which produces substantially equal E and H plane illumination patterns" was definite because one of ordinary skill in the art would know what was meant by "substantially equal." *Andrew Corp. v. Gabriel Electronics*, 847 F.2d 819, 6 USPQ2d 2010 (Fed. Cir. 1988). (MPEP §2173.05(b))

Similar to the *In re Nehrenberg* case, the specification of the present specification provides guidelines that render the term “substantially the same” definite. In the present specification, one guideline provided is that the composition of the impure copper seed layer and impure copper fill are substantially the same because both are derived from a source with a particular impurity content.

The composition of the impure copper seed layer and the electroplated copper, however, remains substantially similar because the copper in the impure copper seed layer and the electroplated copper are both derived from a source with an impurity content of not more than 1.20% by weight and not less than or equal to

0.001% by weight. (¶20).

Not only is this guideline described in the specification, but this guideline is now claimed as well, further rendering the term “substantially the same” definite. The specification even described not just that the source had the same impurity content, but that the source was the same type. In fact, use of the same type source was described as the preferred method for formation of the copper.

The preferred method for formation of a copper seed layer of substantially the same composition as the electroplated copper comprises using an impure copper target and depositing the target material on the barrier layer, which is accomplished by electroplating the target with the **same type** of copper plating bath that is used to fill the BEOL interconnects. (¶P22).

In addition to the specification, the claims as originally filed contemplated source equivalence.

A copper interconnect as in claim 1, wherein said copper source of said impure copper seed layer is equivalent to said copper source of said impure copper. (Claim 2).

Therefore, one of ordinary skill in the art would understand that the material composition of the impure copper seed layer and the impure copper fill would be “substantially the same” as each are derived from a source with the same particular impurity content.

The present specification provides another guideline for the limitation that the composition of the impure copper seed layer and impure copper fill are substantially the same. More specifically, the specification described that the method of deposition of the impure copper seed layer affects impurities in the impure copper seed layer.

Deposition of the seed layer affects the trace elements, i.e. impurities, in the

impure copper. For example, one method of deposition for the seed layer is known as sputtering. The impurities in the impure copper seed layer will not sputter exactly as the impurities in the electroplate copper bath electroplate. Accordingly, the composition of the copper in the impure copper seed layer and the electroplated copper will be slightly different...The composition of the impure copper seed layer and the electroplated copper, however, remains substantially similar because the copper in the impure copper seed layer and the electroplated copper are both derived from a source with an impurity content of not more than 1.20% by weight and not less than or equal to 0.001% by weight. (§20)

Similar to the guideline in the specification regarding impurity content of the sources for both the impure copper seed layer and impure copper fill, this guideline with respect to the term “substantially the same” is also claimed. Both claims 1 and 13 require “wherein material composition of said impure copper seed is substantially the same as material composition of said impure copper fill except some impurities in the impure copper fill are absent from the impure copper seed layer as consequence of deposition of the impure copper seed layer.”

Therefore one of ordinary skill in the art would understand that because the impure copper seed layer and impure copper fill are derived from a source with the same content of impurities that the material composition of the impure copper seed layer and impure copper fill would be substantially the same. Further one of ordinary skill would understand that a deposition technique applied to the impure copper seed, but not applied to the impure copper fill, would cause certain discrepancies in the content of the impure copper seed layer. For these reasons, Applicants contend that the term “substantially the same” is definite.

### **Conclusion**

In view of the foregoing remarks, Applicants respectfully submit that all pending claims are in condition for allowance. Favorable reconsideration and allowance of the claims are respectfully requested.

No fees are believed to be due in connection with this paper. However, if there is any such fee due, please charge any such fee to the deposit account No. 09-0458.

Respectfully submitted,

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